LEWIS BOSS.[1]

By R. H. Tucker.

The life work of Lewis Boss, in astronomy of precision, terminated on October 5th. For thirty-six years he had been director of the Dudley Observatory, at Albany, New York, an institution devoted exclusively to meridian determinations of the places of the stars, one of the small number of observatories in America where any important work of this nature is done at the present time.

He was born at Providence, Rhode Island, October 26, 1846, and received his bachelor degree at Dartmouth College in 1870. His course in astronomy was taken there under Professor Young, afterwards director of the observatory of Princeton College. His taste for astronomy found no expression during his college course, but soon after its completion, and while occupying a position in the Government Land Office at Washington, he took up the practice of the sextant in his spare hours, and obtained some precise and illuminating results from the discussion of the errors and the limitations of this instrument.

He had already formed acquaintance with the astronomical staff of the U. S. Naval Observatory at Washington, and when the U. S. Government Commission was organized, to co-operate with that of Canada in the delineation of the unsurveyed part of the boundary between the two countries, he received the appointment of assistant astronomer, under Major (then Captain) Twining of the U. S. Engineer Corps. The zenith telescope observations on the boundary work were practically all made by Professor Boss, with the concurrence of the Canadian party.

The need of precise places for the stars, used in the latitude work, led him to take up the discussion of existing observations of declination. The development of the existing systematic errors, in the star catalogues employed, carried him on to the investigation of instrumental errors, and of the methods of reduction. The lack of a homogeneous standard system in the adopted declinations of the fundamental stars, which became evident, induced him to extend the original plan, and to form

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a new declination system, the results of which were published in 1878 as a catalogue of five hundred stars, in the Report of the U. S. Northern Boundary Commission. The construction of this declination system illustrates very clearly the manner in which later contributions to astronomy were conceived and the way in which they were expanded and carried out, with constantly widening import and effectiveness.

In 1876 he was called by the Board of Trustees of the Dudley Observatory to the directorship, where his first work of importance was the observation of the zone $+1°$ to $+5°$ of the Astronomische Gesellschaft. This zone had been assumed by another observatory soon after the inauguration of the scheme, but had been practically abandoned. The delay thus caused made the Albany zone one of the latest in being begun, and the mean epoch, at which the average of the observations had been planned to fall, had already passed. But the energy with which the work was carried through, and the promptness with which it was reduced and prepared for publication, have more than compensated for the late start. While provisionally begun in 1878, it was not until 1879, ten years after the beginning of many of the zones by other observatories, that the observations were actually counted towards the completion of the program. The entire observing was finished in less than four years, while the greater part of the observations necessary to meet the requirements of the plan were made in less than three years. Although the computing staff was at all times relatively small, the reductions were carried forward promptly, and the catalogue was published in 1890, the first year in which any of the A. G. zones appeared in print.

The graduation errors were measured, and corrections applied, for every division employed. This thorough investigation of instrumental errors and the confident application of the resulting corrections characterize much of his work. All of the transits were observed by Professor Boss, and he investigated the effect of magnitude at a time when this form of personal equation was first attracting attention.

The catalogue contained a detailed comparison with many older sources of star positions: D'Agelet, Piazzi, Lalande, Bessel, Struve, Rümker, Argelander, and Schjellerup

being included. The probable errors of observations are satisfactorily small in this zone, less than $\pm$ 0″.6 for one observation in either co-ordinate, or nearly double the limiting precision stipulated in the Gesellschaft scheme.

The period following the completion of the zone work was mainly given up to comet investigations, and the Dudley Observatory was for a time an important center for computations of orbits and ephemerides. But, finally, he was able to arrange for the erection of a new observatory, which was completed in 1893, on a more favorable site than the former one, at which some of the observing conditions and the facilities for reasonably comfortable living left much to be desired. The Pistor and Martins transit circle was removed from the old building and installed in a steel building of modern design apart from the main observatory. The circles were graduated anew, and a complete investigation of division errors, down to 10′ divisions, was made. A new equatorial telescope was provided for the new observatory.

After devoting ten years to the investigation and discussion of standard star-places, more liberal opportunity for extending these researches was provided by the Carnegie Institution of Washington, which furnished him a special grant extending over ten years. In 1904 he was made director of the department of meridian astronomy, specially created for this purpose. Plans had been gradually developed for a great catalogue, to contain 25,000 stars, embodying all existing material for those stars, of proper weight, and including modern observations, to be made, in part at least, with the transit circle of the Dudley Observatory. Physical disabilities had meanwhile prevented his taking active part in any extensive series of observations, but the beginning of the work upon the stars of the northern sky was undertaken under his direct and continuous personal supervision at Albany.

When some ten thousand observations had been accumulated from this portion of the sky, he planned to interpolate the necessary observations from the Southern Hemisphere. The execution of this part of the general plan was put into other hands, with the intention that the entire series of observations, made with the same instrument in both hemispheres, would be

knit into one homogeneous system, which will depend upon fundamental work at both stations. The southern observations, 87,000 in number, were made in the years 1909 to 1911, at a temporary observatory established at San Luis, in the Argentine Republic. Less than three years were consumed from the first construction, undertaken at Albany in 1908, to the return of the instrument and equipment to its original location. The observations were completed in less than two years, for the greater part of which fundamental determinations were made, conjointly with those upon the general list of 15,000 stars observed at San Luis.

Meantime, at Albany, the Preliminary General Catologue of 6,188 stars had been prepared, and was issued by the Carnegie Institution in 1910. This includes all the important stars which may be used as standard reference points, and the system of this catalogue will be that of the extensive one, in preparation. This entire plan, including the southern observations, had been under constant discussion for a period of fifteen years, and it must be a source of gratification to the astronomical world to be assured that so much of the essential part has been completed.

Professor Boss made many contributions to astronomy, aside from his special work upon meridian determinations of star places. He lectured at various times, mainly upon the Sun; and in 1881 wrote a prize essay upon the origin of comets, which was distinguished among more than one hundred competitors. His knowledge of astrophysics was wide and accurate, though none of his work was done in this line. He observed the transit of *Venus,* in 1882, at Santiago, Chile, as the only civilian chief of the eight government parties that were organized for that event. The observations were mainly photographic, and it was necessary to employ two professional photographers to develop and handle the plates, as but few astronomical observers were trained at that time to take up the details of photography.

He has been editor of the *Astronomical Journal* since 1909, and was, for several years previous, acting as associate editor. The discovery of the star stream in *Taurus* is a recent notable advance, in clearing up the meaning and effect of the proper

motions of the stars, based upon the slowly increasing knowledge of these motions given by measures of position.

The Dudley Observatory has been nominally connected with Union College, Schenectady, New York, as a special department, and the director of the observatory has held the rank of professor in that institution. The honorary degree of A. M. was conferred upon Professor Boss by Dartmouth in 1877, of LL.D. by Union in 1902, and of Sc. D. by Syracuse in 1910.

He received the gold medal of the Royal Astronomical Society in 1905, and the Lalande prize of the Paris Academy of Sciences in 1911. He was a member of the National Academy of Sciences and of the Astronomische Gesellschaft, a Foreign Associate of the Royal Astronomical Society, and a corresponding member of the British Association, the Prussian Academy, and of the St. Petersburg Academy.

His personal acquaintance with astronomers of all nations was extensive, and his friendship with those abroad was renewed by several European visits. Close affiliation with the most prominent men in this country was kept up at the meetings of the National Academy of Sciences at Washington, which he very rarely failed to attend. His last appearance at those meetings will be recalled by his friends as his last active participation in general scientific affairs.

Professor Boss was married in 1871 to Miss HELEN HUTCHINSON of Washington. His widow, three daughters and a son, all of the children now married, have survived him, as members of a family circle that was always singularly devoted and united, in intimate contact daily with the origination, the development, and the execution of his many varied plans of work.

HENRI POINCARE.[1]

HENRI POINCARÉ was born at Nancy on the 29th of April, 1854. His family was from Lorraine; his grandfather practiced pharmacy in Nancy; his father, in the same town, was a public-spirited doctor and an able lecturer on medicine; his

[1] From the obituary by LEBON in *Astronomische Nachrichten*, **192**, 335, 1912. Translated and abridged by J. H. PITMAN.